

St. Bernard
Air
Monitoring
Project
Final
Report

July 30

2009



This report was prepared by the Office of Environmental Assessment, Air Quality Assessment Division.

Project Overview

Prior to the start of this project, the Department of Environmental Quality (DEQ) received and investigated numerous odor complaints from citizens living in the Chalmette, Louisiana area. At the request of the local citizens and through negotiation with the Chalmette Refinery, an Administrative Order on Consent was signed on May 24, 2005. Under the terms of the Order, the refinery installed fixed ambient monitors at three locations designed in accordance with department directives as shown in Figure 1. Two of these sites, Chalmette High School and Chalmette Vista, are in St. Bernard Parish and the third one, Algiers Entergy, is located across the Mississippi River in Orleans Parish.



Figure 1. Sampling Site Locations

The locations of the three ambient monitoring sites were chosen for two primary reasons. An examination of a wind rose generated for the greater New Orleans area showed that winds predominantly originated from southerly directions varying from southeast to southwest. Thus, emissions from the refinery and other industrial sources in the area should impact a sampler sited on the northwest side of the complex at a much greater frequency than at another location. The Vista site, located on East Chalmette Circle, is located in this ideal position. The Chalmette High School site was located to detect similar emissions when the winds were from the southwest. In addition, this site was located fairly close to the Chalmette Refinery tank farm area located east of the refinery. This put the site in an ideal position to detect emissions from the tank farm area when the winds were from the south. The Entergy site, in Orleans Parish near General Meyer Avenue, monitors regional air quality and provides background information when the wind direction is from the south. This site also provides a reading of the industrial complex area emissions when the wind direction is from the north.

The primary purpose of this project was to investigate what caused odors, if odor causing compounds are air toxic and if their concentrations in the ambient air in the Chalmette area are in compliance with the state and federal ambient air quality standards. In addition, the DEQ was fully to use its facilities to monitor for ozone and fine particulate matter PM_{2.5}, and investigate other compounds such as benzene and 1, 3-butadiene that cause no odors at lower concentrations but are of great health concern for long time exposure even in lower concentrations. The DEQ uses the methodology that is proven and legally defensible nationwide for air pollutants. The resulting monitoring data has a high standard of quality assurance and validity as set forth in the DEQ Quality Assurance Project Plans for air toxics and ambient air monitoring.

The project began in the spring of 2006 and was destined for an initial two-year operational period. The three monitoring sites were to be managed and serviced by DEQ personnel. As per the terms of the Order, the DEQ would periodically assess the air quality data to determine if the project should be expanded, reduced or discontinued.

Odor

Odors can be caused by a single chemical compound or by a combination of compounds. Some odor causing chemicals such as hydrogen sulfide and carbon disulfide are air toxics and regulated either by the U. S. Environmental Protection Agency (EPA) or by the state of Louisiana. Other odor-causing chemicals are not air toxic or not a health concern in moderate concentrations.

Nearly all state and federal air quality regulations are based on health impacts because compounds that pose known health risks are a more imminent concern to public welfare than those that are solely an odor issue. Although an odor may be offensive to a particular individual, it is more scientifically justifiable to establish limits based on the protection of public health than to try to establish more subjective odor standards. People can have markedly different perceptions about the magnitude and offensiveness of an odor. Although research is being conducted nationally on developing techniques to measure odors, the DEQ does not believe current methods are precise.

The DEQ investigates odor complaints received from the public and uses ambient air data collected at the monitoring stations to make compliance determinations. Permit limits and upset releases are also evaluated during these investigations.

Study Focus

The focus of this monitoring project was to:

- Identify the chemical compounds that are most abundantly present in the ambient air in the Chalmette area of St. Bernard Parish.
- Identify any chemical component(s) that may be responsible for the odor complaints.
- Compare the measured chemical levels, along with appropriate statistical confidence limits, to the applicable ambient air standards established by the DEQ and the EPA.

Many factors can influence the ambient concentrations of pollutants at any given time and location. Weather factors such as wind direction and mixing height must be considered along with permitted industrial emissions, mobile sources, natural background and transported pollutants when assessing the air quality in an area. When the data collected are evaluated, all these factors will be considered.

Sampling and Analytical Methods

Several sampling and analysis strategies were considered in the sampling and analysis plan for this project. The monitoring sites contain specialized instruments to measure concentrations of the pollutants ozone, sulfur dioxide (SO₂), hydrogen sulfide (H₂S), volatile organic compounds (VOCs) and respirable particulate matter, in accordance with federal air monitoring requirements.

All VOC sampling and analyses were conducted using the DEQ's standard operating procedures developed based on EPA Method TO-15, "Compendium to the Determination of Toxic Organic Compounds in Ambient Air." and EPA/600-R98/161, "Technical Assistance Document for Sampling and Analysis of Ozone Precursors". They involve the collection of air samples in specially prepared stainless steel canisters with subsequent analyses using techniques of gas chromatography with flame ionization detectors and mass spectrometry (GC/FID and GC/MS). The samples were analyzed in the DEQ's Air Organics Laboratory for 107 VOCs. Many of those 107 VOCs are in the EPA's or the DEQ's Hazardous Air Pollutants (HAPs) list.

In order to determine compliance with the state ambient air standards, the sites used a statistical canister sampler operating on a 24-hr/once every 6th day schedule, the same as the statewide air toxics sampling schedule. The samplers are run from midnight on the scheduled sampling day until midnight on the following day. Sampling was conducted with a Model 911A Portable Summa Canister manufactured by RM Environmental Systems Incorporated.

Because of public concern about sudden releases of chemicals into the air, the sites were also equipped with a continuous methane/non-methane hydrocarbon analyzer and a triggered canister sampler. The continuous hydrocarbon analyzer used was a TECO model 55C. This instrument was connected to an ESC data logger which recorded the data in 10 minute averages including total non-methane organic compound (TNMOC). The trigger level was usually set at 1500 ppbC (parts per billion carbon) of TNMOC. When a 10 minute average TNMOC exceeded the set trigger level, the data logger activated the sampler to collect a 25-minute duration canister sample. All samples were picked up within 24 hours after collection and returned to the DEQ laboratory for analysis.

In addition to identifying and quantifying 107 target VOCs, the laboratory also used the GC/MS to identify other untargeted compounds that may have been in the sample matrix and used GC/FID to estimate their concentrations. The laboratory identified and listed any compound that had an estimated concentration of 5 ppbv (parts per billion volume) or higher. In this study, organic sulfur compounds are especially looked for since very low concentrations of those compounds such as mercaptans and disulfides can cause strong unpleasant odors.

All monitoring for SO₂ was conducted using the EPA's reference method for SO₂ monitoring in ambient air. This method utilizes the fluorescence of SO₂ when it is subjected to an intense ultraviolet light. While there is no EPA reference method for H₂S, the monitor utilized converts the H₂S present to SO₂ and then uses the SO₂ reference method to measure the concentration of the gas present.

All monitoring for ozone was conducted using the EPA's reference method for ozone monitoring in ambient air.

Two types of samplers were used to measure PM_{2.5}. One was operated using the EPA's reference method. This sampler was operated on the federal 24-hr/once every 6th day schedule. The other one (TEOM) uses non-reference method and was operated on a continuous basis. All continuous monitoring data collected was stored on a data logger which recorded the hourly and 5-minute average concentration of each pollutant. Continuous wind speed and direction data was also collected and recorded on the data logger.

Results and Discussion

Over 13,000 hours of continuous valid data has been collected at the Algiers Entergy site since the project start in June, 2006. The average analytical results for SO₂ and H₂S were very consistent between 2006 and 2007. Monitoring at the Algiers Entergy site was suspended in 2008 as a result of Hurricane Gustav. The average TNMOC did trend slightly lower in 2007. Table 1 and Table 2 summarize yearly monitoring data collected through 12/31/2007.

Table 1. 2006 Algiers Entergy -- Yearly Monitoring Data Summary

Pollutant	One-Hour Maximum	Three-Hour Maximum	Eight-Hour Maximum	24-Hour Maximum	Annual Mean
Sulfur Dioxide (ppb)	154	122		38	4
Hydrogen Sulfide (ppb)	81		42		2
TNMOC (ppbC)	4420				168

Table 2. 2007 Algiers Entergy -- Yearly Monitoring Data Summary

Pollutant	One-Hour Maximum	Three-Hour Maximum	Eight-Hour Maximum	24-Hour Maximum	Annual Mean
Sulfur Dioxide (ppb)	306	198		48	5
Hydrogen Sulfide (ppb)	91		31		2
TNMOC (ppbC)	3960				128

At the Chalmette High School site, over 20,000 hours of continuous valid data has been collected since the project start in May, 2006. The average analytical results for ozone, SO₂ and H₂S were all very consistent between 2006, 2007, and 2008. Table 3, Table 4 and Table 5 summarize yearly monitoring data collected through 12/31/2008.

Table 3. 2006 Chalmette High -- Yearly Monitoring Data Summary

Pollutant	One-Hour Maximum	Three-Hour Maximum	Eight-Hour Maximum	24-Hour Maximum	Annual Mean
Ozone (ppb)	107		81		29
Sulfur Dioxide (ppb)	95	53		18	3
Hydrogen Sulfide (ppb)	48		26		2
TNMOC (ppbC)	6380				131

Table 4. 2007 Chalmette High - Yearly Monitoring Data Summary

Pollutant	One-Hour Maximum	Three-Hour Maximum	Eight-Hour Maximum	24-Hour Maximum	Annual Mean
Ozone (ppb)	93		83		29
Sulfur Dioxide (ppb)	95	61		14	4
Hydrogen Sulfide (ppb)	58		24		3
TNMOC (ppbC)	3780				96

Table 5. 2008 Chalmette High -- Yearly Monitoring Data Summary

Pollutant	One-Hour Maximum	Three-Hour Maximum	Eight-Hour Maximum	24-Hour Maximum	Annual Mean
Ozone (ppb)	75		71		29
Sulfur Dioxide (ppb)	116	53		12	4
Hydrogen Sulfide (ppb)	44		23		3
TNMOC (ppbC)	5510				99

At the Chalmette Vista site, over 20,000 hours of continuous valid data has been collected since the project start in May, 2006. While the levels of SO₂ were higher at this site compared to the other sites in the area, the results were very consistent between 2006, 2007 and 2008. The average TNMOC was significantly lower in 2007. Table 6, Table 7, and Table 8 summarize yearly monitoring data collected through 12/31/2008

Table 6. 2006 Vista -- Yearly Monitoring Data Summary

Pollutant	One-Hour Maximum	Three-Hour Maximum	Eight-Hour Maximum	24-Hour Maximum	Annual Mean
Sulfur Dioxide (ppb)	271	174		104	9
Hydrogen Sulfide (ppb)	114		40		3
PM2.5 (µg/m ³)	180.2			35.8	12.5
TNMOC (ppbC)	5840				107

Table 7. 2007 Vista -- Yearly Monitoring Data Summary

Pollutant	One-Hour Maximum	Three-Hour Maximum	Eight-Hour Maximum	24-Hour Maximum	Annual Mean
Sulfur Dioxide (ppb)	477	321		112	9
Hydrogen Sulfide (ppb)	69		28		3
PM2.5 ($\mu\text{g}/\text{m}^3$)	192.4			37.1	12.1
TNMOC (ppbC)	1920				28

Table 8. 2008 Vista -- Yearly Monitoring Data Summary

Pollutant	One-Hour Maximum	Three-Hour Maximum	Eight-Hour Maximum	24-Hour Maximum	Annual Mean
Sulfur Dioxide (ppb)	363	287		103	9
Hydrogen Sulfide (ppb)	57		36		3
PM2.5 ($\mu\text{g}/\text{m}^3$)	161.2			25.9	10.7
TNMOC (ppbC)	4000				80

The levels of SO₂ measured at the three monitoring stations are somewhat higher than the measurements collected at other locations in the state. The EPA's SO₂ Primary National Ambient Air Quality Standards (NAAQS) for annual and 24-hr averages are 30 and 140 ppb, respectively. EPA also has a secondary standard for SO₂. It is the 3-hr rolling average and it is 500 ppb.

Table 9 shows that the highest annual concentration of SO₂ measured at all of the sites is well below the annual NAAQS. The maximum 24-hour SO₂ reading observed at Entergy was 48 ppb, which is less than 1/3 of the NAAQS standard. However, the maximum 24-hour average at the Chalmette Vista site was 112 ppb which is about 75% of the NAAQS. The maximum 3-hour average 321 ppb recorded at the Vista site is 64% of the NAAQS.

The Agency for Toxic Substances and Disease Registry (ATSDR) Acute (1–14 days) Minimal Risk Level (MRL) for SO₂ is 10 ppb. No Intermediate or Chronic MRL is available. An ATSDR exposure investigation has indicated that some asthmatics sensitive to SO₂ exposure have developed some respiratory constriction symptoms when exposed to 100 ppb for 10 minutes. During the 33 months of operation, the SO₂ monitor at the Vista site has recorded over 100 one-hour averages which were over 100 ppb.

Table 9. Comparison of SO₂ NAAQS with SO₂ Data Collected at the Three Sites

NAAQS for SO ₂	Max. 3-Hour SO ₂ = 500 ppb	Max. 24-Hour SO ₂ = 140 ppb	Annual Average SO ₂ = 30 ppb
Entergy	122	48	5
Chalmette High School	61	14	4
Chalmette Vista	321	112	9

While these elevated readings represent less than two percent of the monitored time period, these periodic spikes of SO₂ may explain some of the citizen odor complaints. People can smell SO₂ at a concentration as low as 100 ppb. The highest hourly SO₂ reading recorded at the three sites was 477 ppb. At this concentration, people with average sense of smell will smell SO₂. While no NAAQS violation was ever observed, a statistical analysis of the monitoring data collected early in the study did suggest a slight possibility that the 24-hour NAAQS is at risk of being exceeded given worst case meteorological conditions. As a result, the department met with several of the industries in the area and requested that they inspect their facilities for emissions whenever the monitors recorded a reading of 100 ppb or greater.

Pollution roses for SO₂ are presented in Appendix A. They indicate that from which wind directions the concentration of SO₂ tend to be higher. At the Vista site, the highest concentrations are observed when the wind is directly from the south with half of the readings over 20 ppb. At the Chalmette High School site, the highest concentrations are observed when the wind is from a westerly direction with half of the readings over 5 ppb. At the Entergy site, which is located to the south across the Mississippi River, the highest readings occur when the wind is from the north-northwest with half of the readings being just over 1.5 ppb. When all three pollution roses are examined, the highest concentrations appear to converge in an area near the Chalmette Refinery and the adjacent CII Carbon facility.

There is no EPA NAAQS standard for H₂S, but Louisiana has established an 8-hour ambient air standard of 330 micrograms per cubic meter (µg/m³) or 237 ppb. None of the 8-hour average concentrations measured for H₂S were above this 8-hour standard. However, the maximum hourly H₂S reading was as high as 114 ppb. That was recorded at the Vista site. Humans are extremely sensitive to hydrogen sulfide odors and can smell such odors at concentrations as low as 0.5 to 1 ppb. At levels approaching 50 ppb, people can find the odor offensive.

The pollution roses presented in Appendix A show H₂S being emitted from multiple sources. At the Vista site the highest concentrations are observed when the wind is directly out of the south with half of the readings over 4 ppb. The rose also indicates that small amounts of H₂S also tend to come from all wind directions. This is most likely natural background. At the Chalmette High School site, the highest concentrations are observed when the wind is from a westerly direction with half of the readings over 2 ppb. The rose also indicates that H₂S tends to come from all directions with a second significant source to the northeast of the site. At the Entergy site, the highest readings occur when the wind is from the north-northwest with half of the readings being just over 1 ppb. When all three pollution roses are examined, the directions of the highest concentrations converge in the area of the refinery, but also show the presence of much smaller or distant sources including natural background. The calcined coke facility (CII Carbon) has indicated that it is not a source of hydrogen sulfide.

The diurnal profiles in Appendix B show that the highest concentrations of both H₂S and SO₂ tend to occur in the evening and early morning hours. This is most likely due to the lower wind speeds and lower mixing levels during these hours. There also appears to be little distinction between the weekdays and the weekends. The diurnal profile for ozone is very typical of the other locations in the state, showing the highest concentrations during the mid-afternoon.

PM_{2.5} was only measured at the Vista site. The annual NAAQS for PM_{2.5} is 15µg/m³. Effective December 17, 2006, EPA lowered the 24-hour PM_{2.5} standard from 65µg/m³ to 35µg/m³ (based upon the 3-year average of the 4th highest reading each year). The average reading for PM_{2.5} at the Vista site is 11.8µg /m³, which is below the standard and consistent with the air monitor at the DEQ's Kenner

site. The pollution rose for PM_{2.5} at the Vista site shows PM_{2.5} comes from all wind directions, with a slight increase when the winds are from the south.

There were three 24-hour PM_{2.5} averages that were slightly over 35µg/m³. They were recorded on 08/02/2006, 08/03/2006 and 12/31/2007 and had concentrations of 35.8, 35.2 and 37.1 µg/m³, respectively. Reading 37.1 µg /m³ occurred on New Year’s Eve when there was a significant amount of firework activity in the area. One of the hourly readings approached 200µg/m³, as shown in Figure 2. The 4th highest reading during the monitoring period was 25.9 µg /m³.

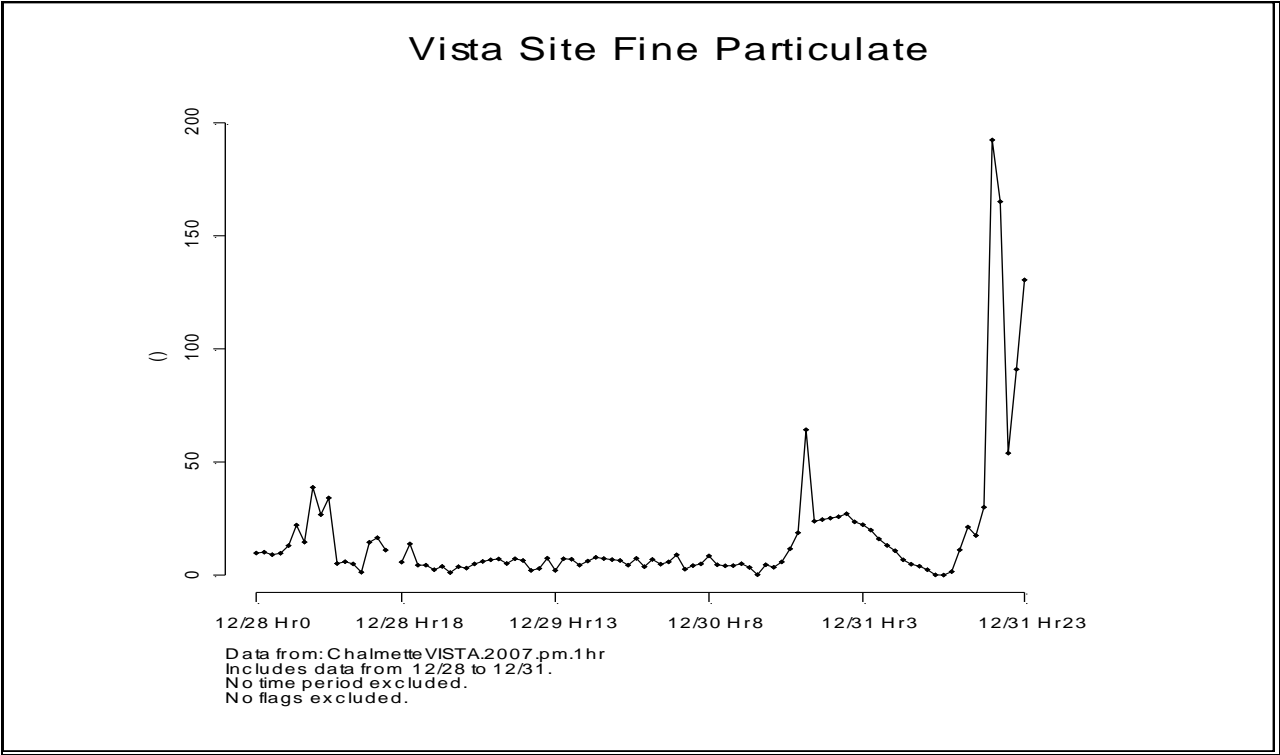


Figure 2. PM_{2.5} Readings at Vista Site on New Year’s Eve 2007

Ozone was only measured at the Chalmette High School site. The NAAQS for ozone is based on the 4th highest 8-hour average reading over 85 ppb. The highest 8-hour ozone reading at the site was 83 ppb and the 4th highest 8-hour reading was 76 ppb which was below the 1997 8-hour standard and consistent with the air monitor at the Kenner site. The pollution rose for ozone at the High School site shows the ozone is generated from all wind directions with a slight increase when the winds are from the northwest.

VOC canisters were collected at all three of the sites with analytical results from both the 24-hour canisters and the high TNMOC triggered “strike” canisters. To determine compliance with the DEQ annual average ambient standards, the DEQ calculated annual average concentrations for each of the 55 VOC measured using only the 24-hour samples. Summary tables of the VOC results are listed in Appendix C. Table 10 below shows the average concentrations for several key VOCs and their Louisiana Annual Ambient Air Standards.

Table 10. VOC Analytical Results of Twenty-Four Hour Samples

Site	Number of Samples	Average Benzene (ppbv)	Average 1,2-Dichloroethane (ppbv)	Average Vinyl Chloride (ppbv)	Average 1,3-Butadiene (ppbv)	Average Methylene Chloride (ppbv)
Entergy	144	0.41	0.04	0.00	0.04	0.09
Chalmette High	148	0.29	0.02	0.00	0.03	0.09
Chalmette Vista	178	0.39	0.02	0.00	0.05	0.12
Annual Average Ambient Air Standard		3.76	0.95	0.47	0.42	61.2

As shown in Table 10, a total of 470 of the 24-hour samples at the three sites were collected during the nearly three years of the study. Most of the targeted compounds were detected within the typical concentration range of 0.1 to 1.0 ppbv and generally at or below the statewide averages. The general profile of compounds detected was very typical of an area dominated by mobile source emissions. All of the average concentrations for the toxic compounds are in compliance with the Louisiana Ambient Air Standards. Ninety-five percent confidence intervals were calculated for each of the targeted compounds and the upper limits of the confidence intervals were also well below the Ambient Air Standards.

The only data quality issue that arose was a sampler contamination problem observed at the Algiers site. The only compounds affected were acrylonitrile, acetonitrile and methacrylonitrile. The contamination started when a sampler malfunctioned and was replaced. After elevated readings for the affected compounds were observed for several samples, the sampler was tested and found to be contaminated. After that sampler was replaced the observed concentrations returned to normal. As a result of the contamination, several sample results for the affected compounds had to be invalidated.

A total of 187 of the triggered canister samples were collected in the study. The Chalmette High School site experienced the vast majority of these triggers. The results for these samples were highly variable depending mostly on the wind direction at the time of collection and the point source emissions which triggered the sampler. The concentrations in these samples represent the likely maximum concentrations of the various toxic air pollutants. Since these samples represented snapshots of peak concentrations, they should be compared with short-term standards such as the Louisiana 8-Hour Ambient Air Standard or the ATSDR Acute MRLs. All the maximum concentrations of the target compounds in 187 samples are below Louisiana 8-Hour Ambient Air Standards or ATSDR Acute MRLs except for two readings for benzene at the Chalmette High School site. These two readings were 10.07 ppbv on December 6, 2006, and 20.17 ppbv on June 26, 2007. The ATSDR Acute MRL for benzene is 9 ppbv. It has to be pointed out that the sampling time for the strike samples are only 25 minutes. The short-term (15 minutes) standard of NIOSH (National Institute for Occupational Safety and Health) for benzene is 1,000 ppbv. Table 11 shows the maximum concentrations for several common VOCs. Acetone is not in the EPA's HAP list neither in the Louisiana's additional toxic air pollutant list. The ATSDR Acute MRL for acetone is 26,000 ppbv.

Table 11. VOC Analytical Results of Triggered Canister Samplers

Site	Number of Samples	Maximum 2-Butanone (ppbv)	Maximum Toluene (ppbv)	Maximum Styrene (ppbv)	Maximum Acetonitrile (ppbv)	Maximum Acetone (ppbv)
Entergy	55	1.50	25.51	0.15	3.64	18.50
Chalmette High	103	6.70	35.27	0.57	0.90	20.11
Chalmette Vista	29	6.95	26.23	0.25	0.61	166.56
8-hour Ambient Air Standard		4754	2365	1195	373	N/A

An ATSDR MRL is an estimate of the daily human exposure to a hazardous substance that is likely to be without appreciable risk of adverse noncancer health effects over a specified duration of exposure. These substance specific estimates, which are intended to serve as screening levels, are used by ATSDR health assessors and other responders to identify contaminants and potential health effects that may be of concern at hazardous waste sites. It is important to note that the MRLs are not intended to define cleanup or action levels for ATSDR or other agencies. Two of the benzene readings observed at the Chalmette High School site exceeded the ATSDR MRL for a short-term (acute) exposure. Those readings occurred when the wind was out of the southeast. The continuous TNMHC data suggests the high concentrations lasted less than an hour. The overall VOC profile was similar to an evaporative gasoline profile which suggests the source was some type of gasoline loading/transfer activity.

All the 24-hour and strike canister samples were screened for sulfur organic compounds that may contribute to odors. No such compounds were identified.

Conclusions

Since the monitoring project commenced in May 2006, over 100,000 individual air quality measurements have been collected. Ozone and PM_{2.5} measurements are consistent with the measurements collected at the Kenner monitoring site and seem to be typical of New Orleans and most other urban areas of the state. No exceedances of the eight-hour or the one-hour ozone standard have been observed at the Chalmette High School Site.

The average levels of VOCs are consistent with the levels observed in most other urban areas of the state where the VOC profiles are dominated by mobile source emissions. Some periodic spikes of VOCs have been observed at all three monitoring sites. Most of these VOC spikes are very characteristic of evaporative gasoline emissions and are typical of the emissions found in the area near refineries and fuel storage areas. The levels of benzene, 1,3-butadiene, chloromethane and other air toxics are well below the state air toxics standards, and are all equal to or below the levels measured statewide.

The levels of H₂S are consistent with other H₂S measurement collected at other locations in the state. An analysis of the monitoring data with the meteorological data collected has determined there are

multiple small sources of H₂S emissions in the area including some natural sources. No exceedances of the state 8-hour H₂S standard have been observed.

An analysis of the monitoring data with the meteorological data collected has identified the area where most of the SO₂ emissions appear to come from. Some spikes of SO₂ and H₂S have been periodically observed at all three monitoring sites. These spikes are occasionally high enough to be a possible cause of some odor complaints from citizens living in the area. No exceedance of any of the ambient air standards was observed during the course of the study. The data distribution indicates only a very remote possibility of the 24-hour NAAQS for SO₂ being exceeded at any of the monitoring stations.

The averaged readings PM_{2.5} at the Vista site are about eighty percent of both the annual and 24-hour standards. These numbers are consistent with other monitors in this area of the state.

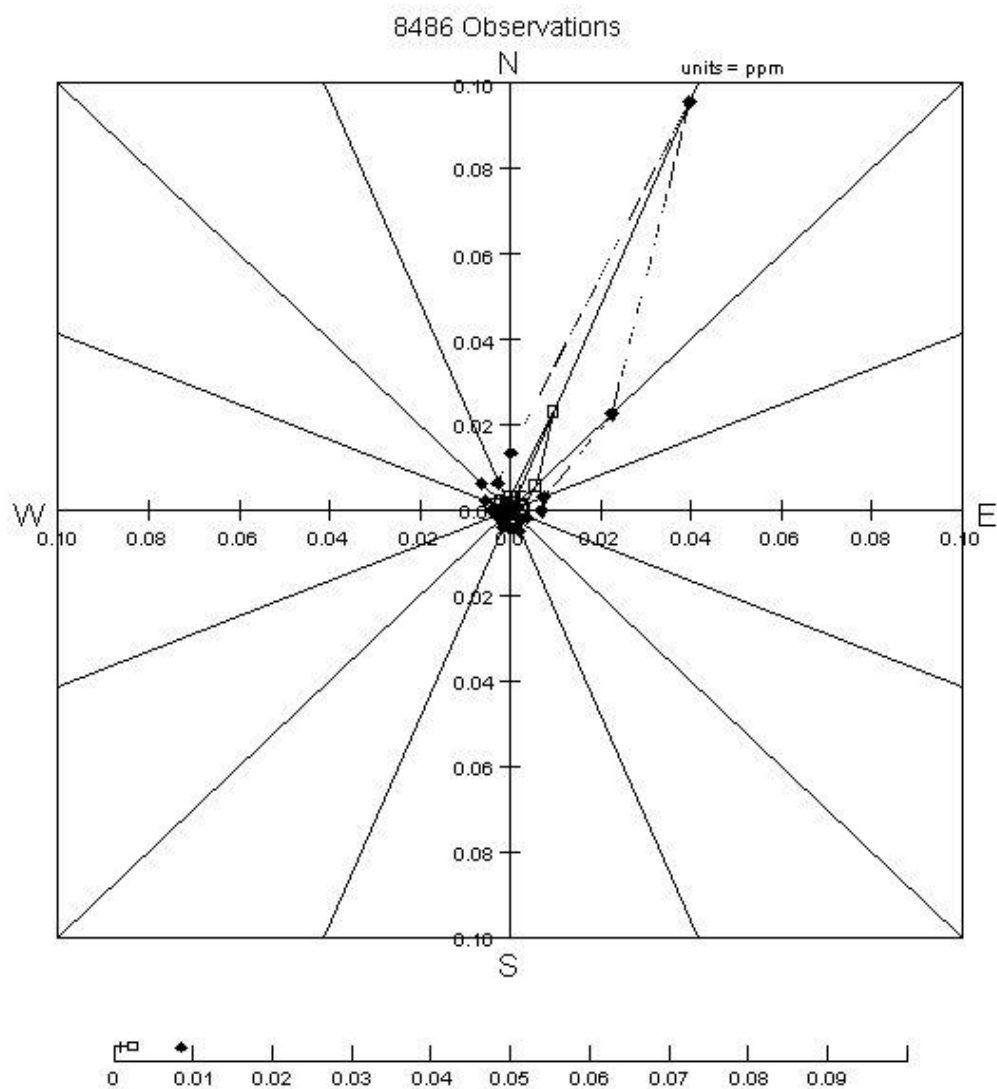
In conclusion, the data collected in this project indicates that the air quality in the Chalmette area of St. Bernard Parish is meeting all EPA and state ambient air standards. The readings at the Algiers Entergy and the Chalmette High School site have been very consistent throughout this project and have not demonstrated any elevated readings that would give cause for concern. While the SO₂ readings at the Vista site do not pose a significant risk to the surrounding community, the occasional elevated readings do warrant further monitoring.

It is therefore recommended that the St. Bernard project as originally designed be reduced to just the operation of the Vista site. The Algiers and Chalmette High School sites are recommended to be shut down and the monitoring assets be redeployed to other areas of interest in the state.

Appendix A

Pollution Roses

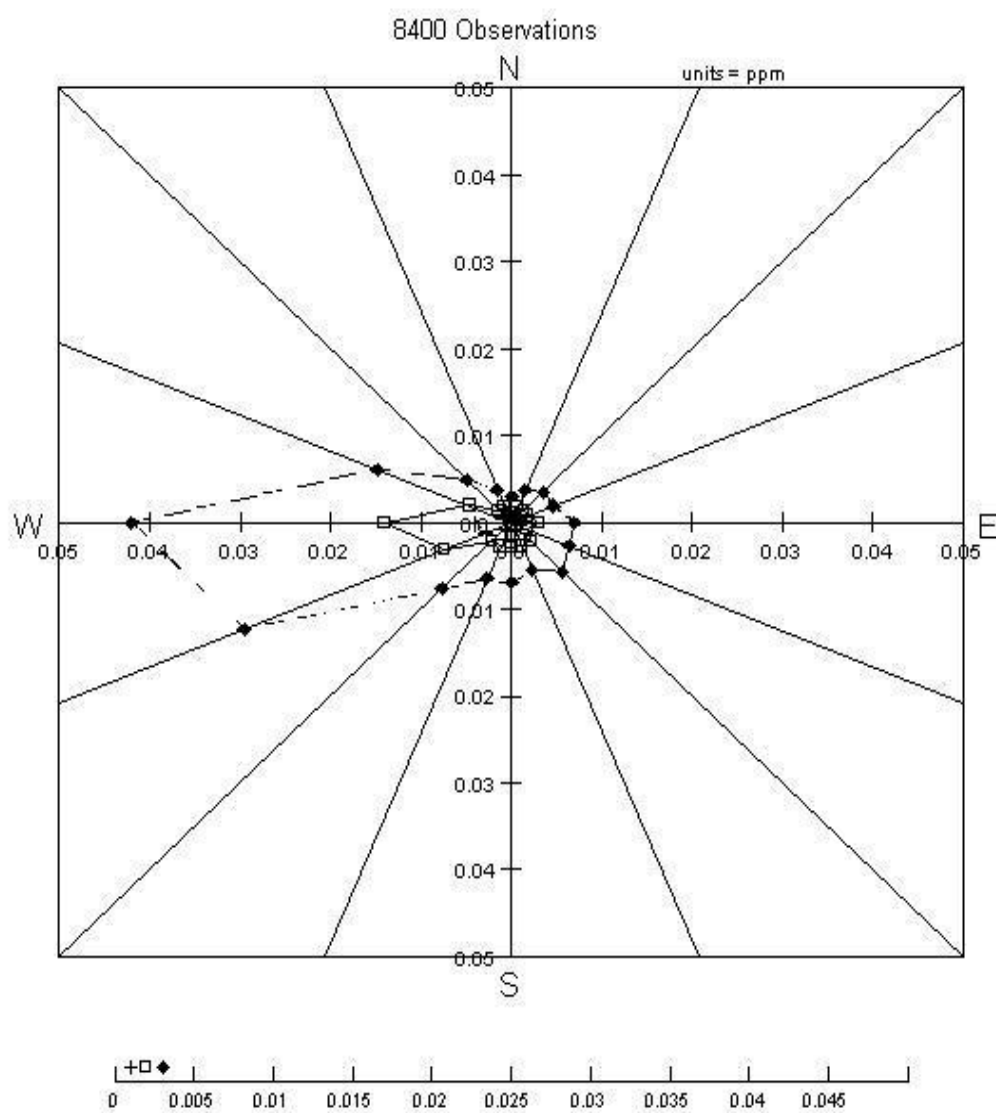
Alqiers Entergy Site 2007 Sulfur Dioxide by Resultant Wind Direction



Includes data from 1/1/2007 to 12/31/2007.
No time period excluded.
Includes hours of day from 0 to 23.
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Chalmette High School 2007
Sulfur Dioxide by Resultant Wind Direction



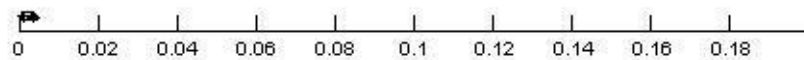
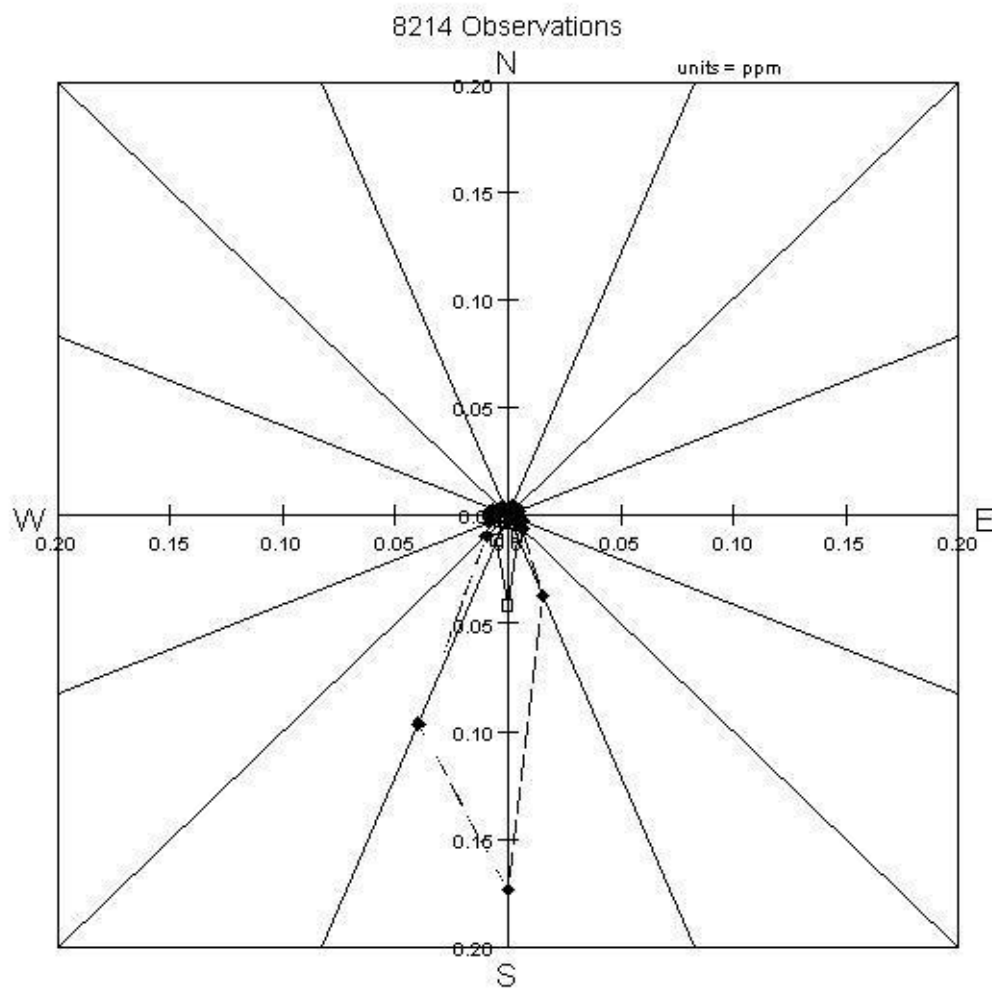
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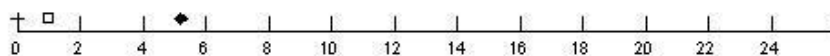
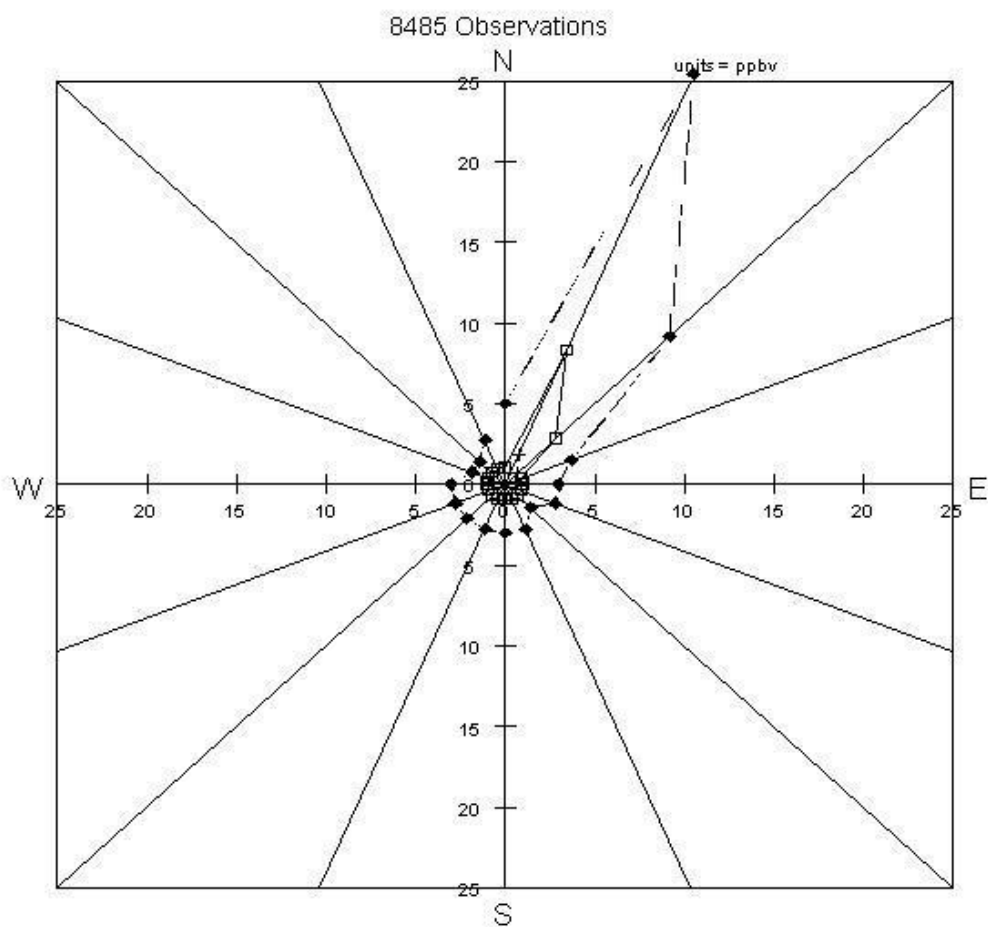
Chalmette VISTA 2007 Sulfur Dioxide by Resultant Wind Direction



Includes data from 1/1/2007 to 12/31/2007.
No time period excluded.
Includes hours of day from 0 to 23.
No flags excluded.

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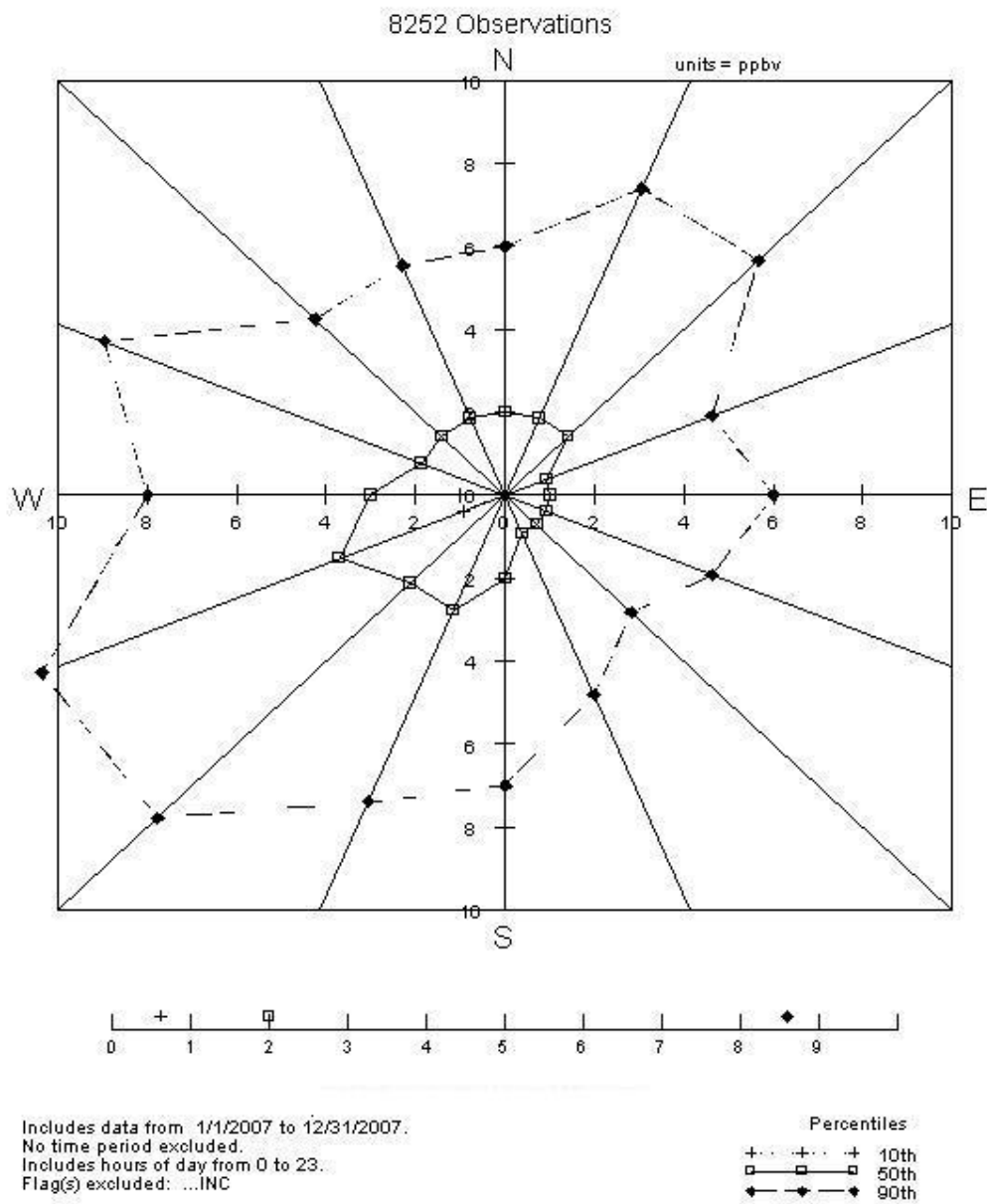
Algiers Entergy 2007
Hydrogen Sulfide by Resultant Wind Direction



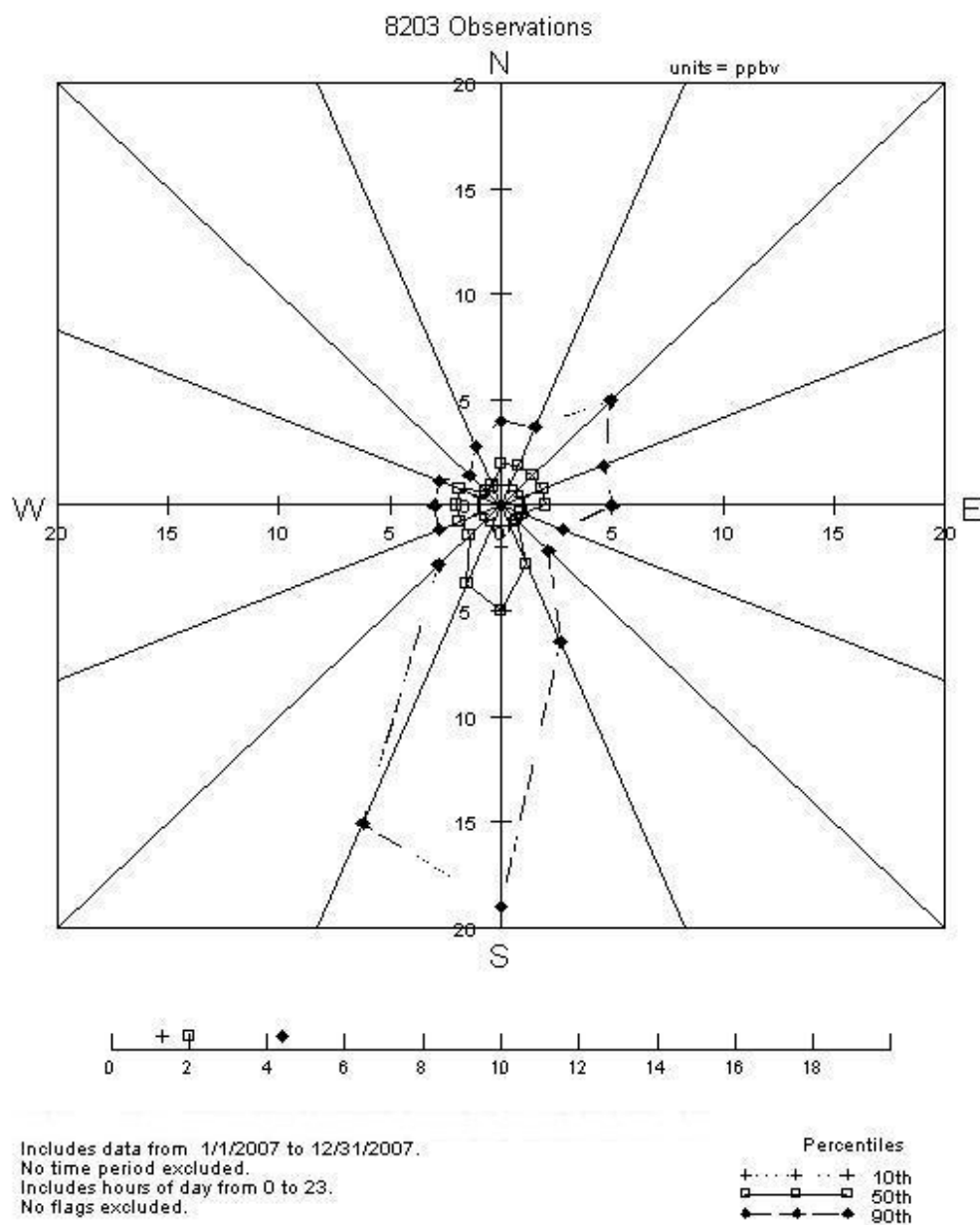
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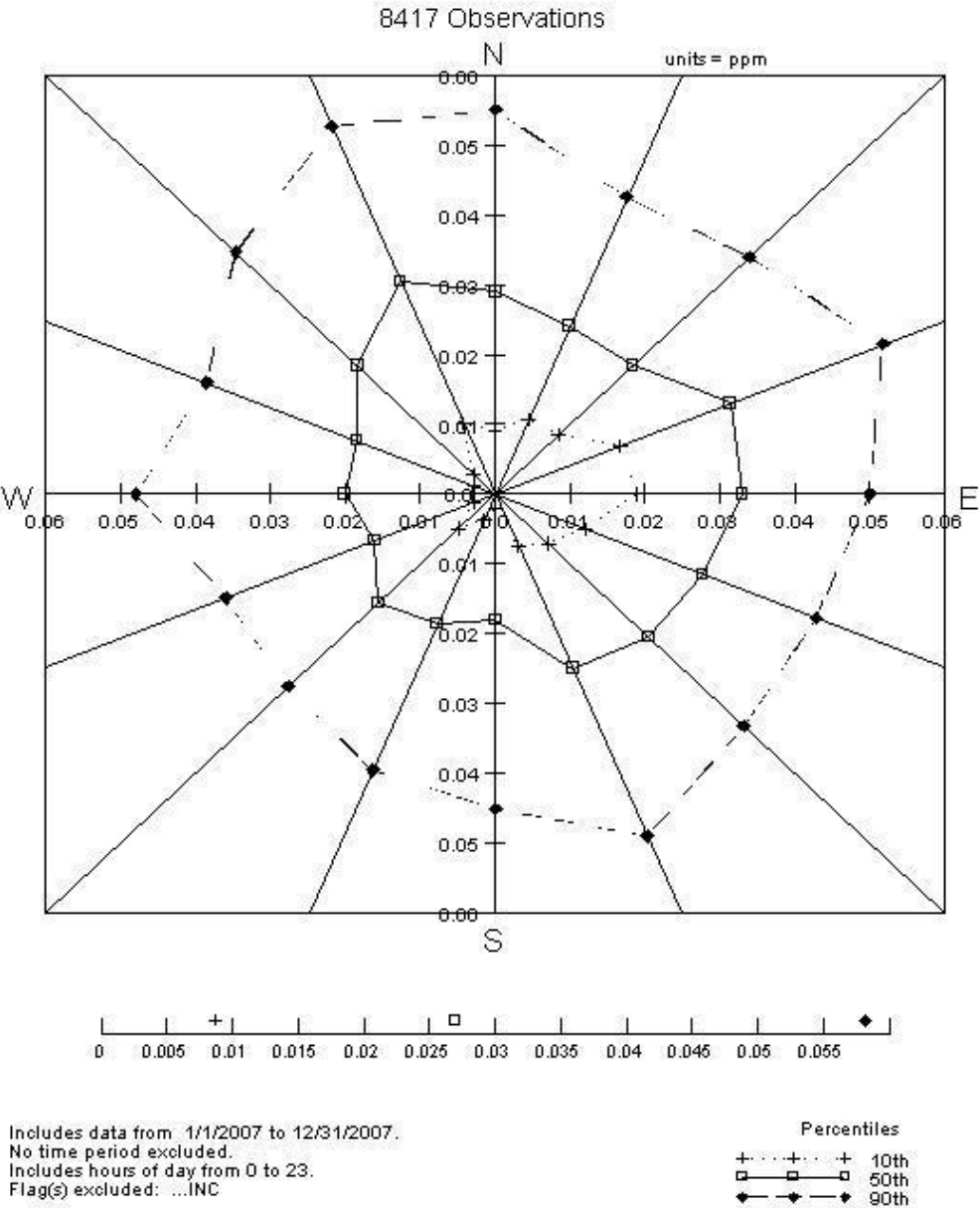
Chalmette High School 2007 Hydrogen Sulfide by Resultant Wind Direction



Chalmette VISTA 2007 Hydrogen Sulfide by Resultant Wind Direction



Chalmette High School 2007
1 Hour Ozone by Resultant Wind Direction

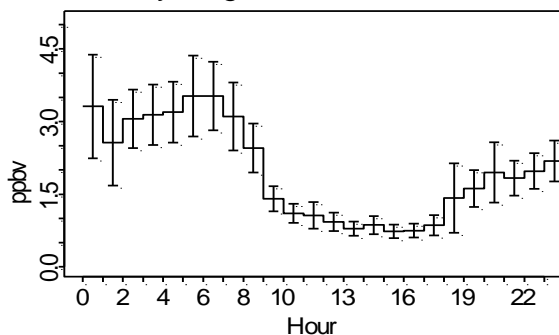


Appendix B

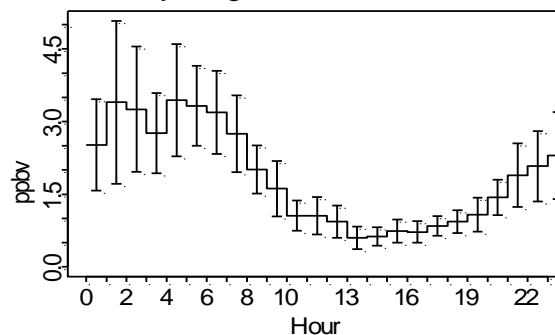
Diurnal Profiles

Diurnal Profiles Algiers Entergy

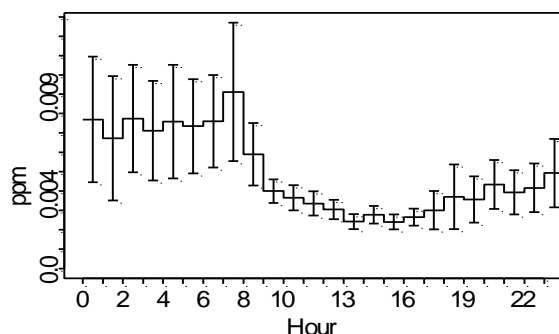
Algiers Entergy
Weekday Only: Hour 0 to Hour 23
Hydrogen Sulfide



Algiers Entergy
Weekend Only: Hour 0 to Hour 23
Hydrogen Sulfide

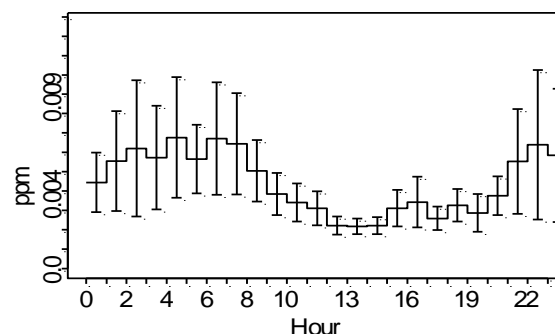


Sulfur Dioxide



Data from: Algiers.2007.aq.1 hr

Sulfur Dioxide

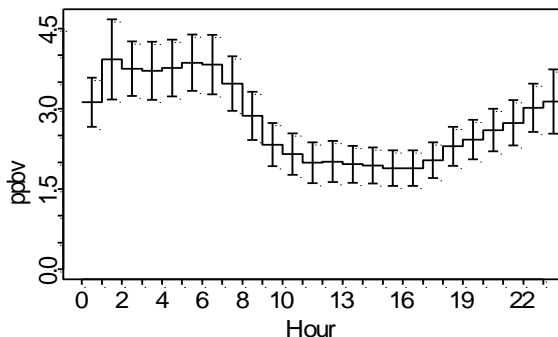


Data from: Algiers.2007.aq.1 hr

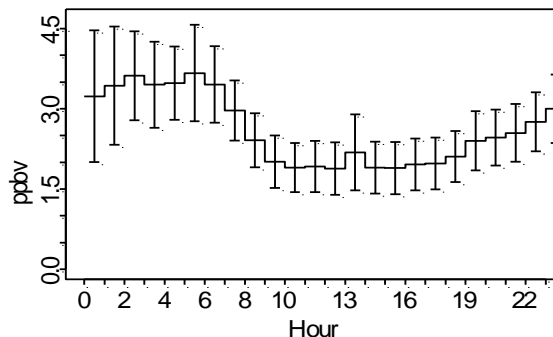
Includes data from 1/1/2007 to 12/31/2007.
No time period excluded.

Diurnal Profiles Chalmette High School

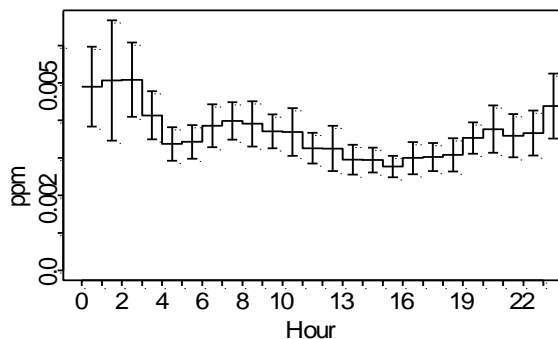
Chalmette High School
Weekday Only: Hour 0 to Hour 23
Hydrogen Sulfide



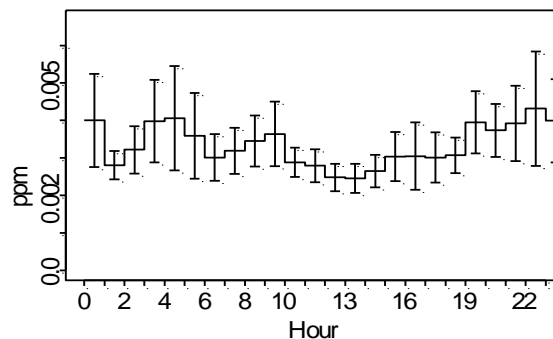
Chalmette High School
Weekend Only: Hour 0 to Hour 23
Hydrogen Sulfide



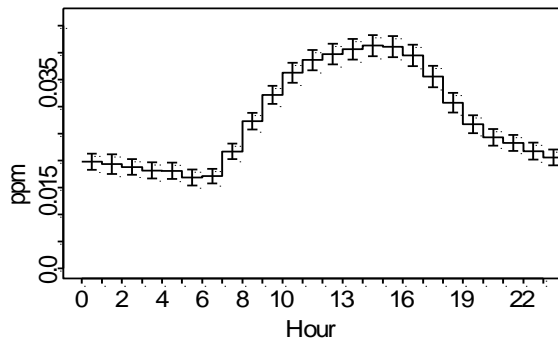
Sulfur Dioxide



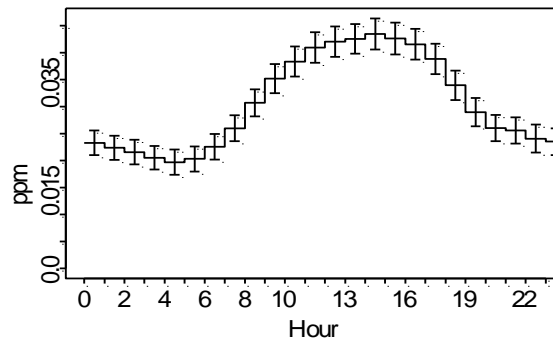
Sulfur Dioxide



Ozone



Ozone



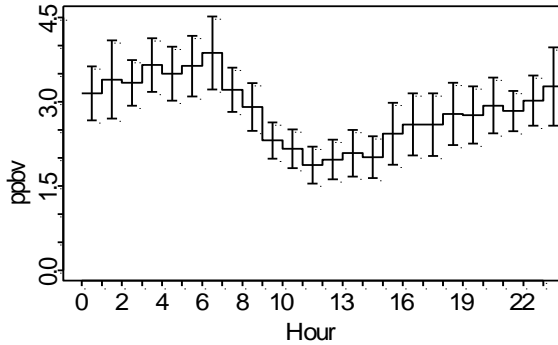
Data from: ChalmetteHS.2007.aq.1hr

Data from: ChalmetteHS.2007.aq.1hr

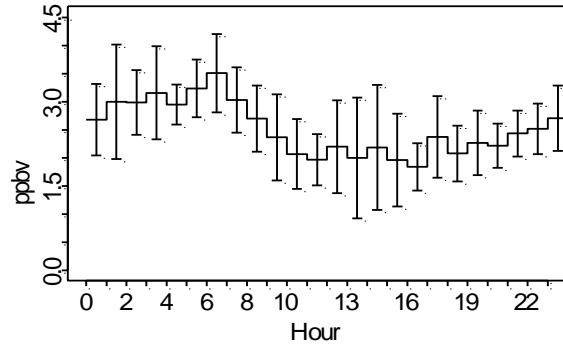
Includes data from 1/1/2007 to 12/31/2007.
No time period excluded.

Diurnal Profiles Chalmette VISTA

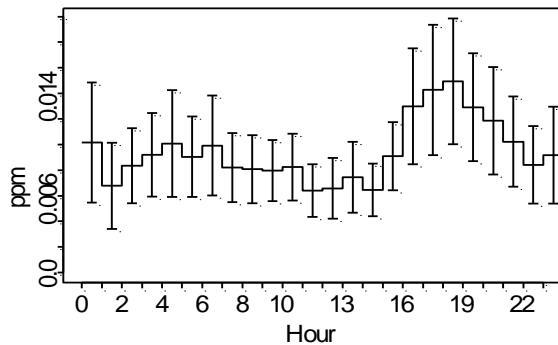
Chalmette Vista
Weekday Only: Hour 0 to Hour 23
Hydrogen Sulfide



Chalmette VISTA
Weekend Only: Hour 0 to Hour 23
Hydrogen Sulfide

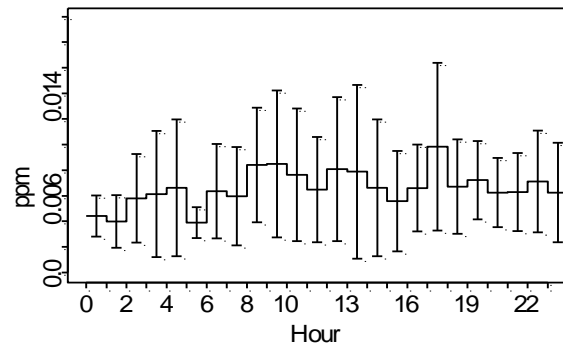


Sulfur Dioxide



Data from: Chalmette VISTA.2007.aq.1 hr

Sulfur Dioxide



Data from: Chalmette VISTA.2007.aq.1 hr

Includes data from 1/1/2007 to 12/31/2007.
No time period excluded.

Appendix C

VOC Summaries

Louisiana Department of Environmental Quality

Air Toxics Summary

Monitoring Site Chalmette Vista
 Samples Collected: 29

Sample Duration: Strike Samples
 Sample Date Range: 5/13/2006-7/11/2008

All Concentrations are in parts per billion volume (ppbv)

<u>Compound</u>	<u>Max</u>	<u>Compound</u>	<u>Max</u>
Freon-12	0.87	trans-1,3-dichloropropene	0.00
Chloromethane	0.80	1,1,2-trichloroethane	0.04
Freon-114	0.02	Toluene	26.23
Vinyl Chloride	0.01	2-Butanone	6.95
1,3-butadiene	0.49	1,2-dibromoethane	0.02
Bromomethane	0.03	Tetrachloroethylene	0.06
Carbon disulfide	0.43	Methyl Acrylate	0.80
Chloroethane	0.00	Chlorobenzene	0.04
Freon-11	0.41	Ethylbenzene	8.11
Acetonitrile	0.61	m/p Xylene	33.80
1,1-dichloroethene	0.03	Styrene	0.25
Methylene Chloride	0.25	o Xylene	3.85
Freon-113	0.09	Nitrobenzene	0.00
Acetone	166.56	2-nitropropane	0.00
1,1-dichloroethane	0.02	1,1,2,2-tetrachloroethane	0.00
cis-1,2-dichloroethene	0.00	1,3,5-trimethylbenzene	6.26
Acrylonitrile	0.40	1,2,4-trimethylbenzene	17.12
Chloroform	0.08	Chlorobutane	0.04
1,2-dichloroethane	0.05	Benzyl Chloride	0.00
Diethyl ether	0.00	4-methyl-2-pentanone	0.90
1,1,1-trichloroethane	0.08	Chloroacetonitrile	0.00
Benzene	5.56	1,3-dichlorobenzene	0.07
Carbon Tetrachloride	0.11	1,4-dichlorobenzene	0.07
Allyl Chloride	0.00	1,2-dichlorobenzene	0.01
1,2-dichloropropane	0.02	1,2,4-trichlorobenzene	0.06
Trichloroethylene	0.02	1,3-hexachlorobutadiene	0.08
cis-1,3-dichloropropene	0.00	2-Hexanone	0.09
MTBE	0.01	Methyl Methacrylate	0.00
Tetrahydrofuran	2.78	Ethyl Methacrylate	0.02

Louisiana Department of Environmental Quality

Air Toxics Summary

Monitoring Site Chalmette Vista
 Samples Collected: 178

Sample Duration: 24 hour Samples
 Sample Date Range: 3/18/2006- 2/18/2009

All Concentrations are in parts per billion volume (ppbv)

<u>Compound</u>	<u>Mean</u>	<u>Max</u>	<u>Compound</u>	<u>Mean</u>	
<u>Max</u>					
Freon-12	0.53	0.72	trans-1,3-dichloropropene	0.00	0.03
Chloromethane	0.66	1.37	1,1,2-trichloroethane	0.00	0.05
Freon-114	0.02	0.08	Toluene	0.54	2.09
Vinyl Chloride	0.00	0.06	2-Butanone	0.43	2.22
1,3-butadiene	0.05	0.74	1,2-dibromoethane	0.01	0.90
Bromomethane	0.01	0.09	Tetrachloroethylene	0.01	0.06
Carbon disulfide	0.08	1.00	Methyl Acrylate	0.00	0.36
Chloroethane	0.00	0.07	Chlorobenzene	0.01	0.06
Freon-11	0.24	0.33	Ethylbenzene	0.10	1.45
Acetonitrile	0.38	0.84	m/p Xylene	0.39	2.13
1,1-dichloroethene	0.00	0.03	Styrene	0.03	1.65
Methylene Chloride	0.12	1.30	o Xylene	0.13	1.45
Freon-113	0.09	0.86	Nitrobenzene	0.00	0.12
Acetone	4.29	17.15	2-nitropropane	0.00	0.12
1,1-dichloroethane	0.01	0.79	1,1,2,2-tetrachloroethane	0.00	0.05
cis-1,2-dichloroethene	0.00	0.04	1,3,5-trimethylbenzene	0.04	0.93
Acrylonitrile	0.50	1.75	1,2,4-trimethylbenzene	0.10	1.26
Chloroform	0.03	0.20	Chlorobutane	0.01	0.57
1,2-dichloroethane	0.02	0.86	Benzyl Chloride	0.00	0.04
Diethyl ether	0.00	0.07	4-methyl-2-pentanone	0.01	0.16
1,1,1-trichloroethane	0.02	0.07	Chloroacetonitrile	0.00	0.00
Benzene	0.39	5.53	1,3-dichlorobenzene	0.00	0.04
Carbon Tetrachloride	0.09	0.14	1,4-dichlorobenzene	0.01	0.08
Allyl Chloride	0.00	0.15	1,2-dichlorobenzene	0.00	0.05
1,2-dichloropropane	0.00	0.05	1,2,4-trichlorobenzene	0.03	0.90
Trichloroethylene	0.01	0.17	1,3-hexachlorobutadiene	0.03	0.98
cis-1,3-dichloropropene	0.00	0.03	2-Hexanone	0.02	0.27
MTBE	0.00	0.09	Methyl Methacrylate	0.00	0.14
Tetrahydrofuran	0.01	0.58	Ethyl Methacrylate	0.00	0.08
Methacrylonitrile	0.02	0.36			

Louisiana Department of Environmental Quality

Air Toxics Summary

Monitoring Site : Chalmette High School
 Samples Collected: 103

Sample Duration: Strike Samples
 Sample Date Range: 5/7/2006-1/5/2009

All Concentrations are in parts per billion volume (ppbv)

<u>Compound</u>	<u>Max</u>	<u>Compound</u>	<u>Max</u>
Freon-12	0.68	trans-1,3-dichloropropene	0.02
Chloromethane	1.09	1,1,2-trichloroethane	0.10
Freon-114	0.04	Toluene	35.27
Vinyl Chloride	0.11	2-Butanone	6.70
1,3-butadiene	18.11	1,2-dibromoethane	0.03
Bromomethane	0.08	Tetrachloroethylene	0.39
Carbon disulfide	0.56	Methyl Acrylate	1.64
Chloroethane	0.10	Chlorobenzene	0.40
Freon-11	0.40	Ethylbenzene	29.0
Acetonitrile	0.90	m/p Xylene	113.46
1,1-dichloroethene	0.10	Styrene	0.57
Methylene Chloride	1.06	o Xylene	19.74
Freon-113	0.11	Nitrobenzene	1.06
Acetone	20.11	2-nitropropane	0.35
1,1-dichloroethane	0.11	1,1,2,2-tetrachloroethane	0.05
cis-1,2-dichloroethene	0.03	1,3,5-trimethylbenzene	1.74
Acrylonitrile	5.18	1,2,4-trimethylbenzene	5.61
Chloroform	0.28	Chlorobutane	0.15
1,2-dichloroethane	0.26	Benzyl Chloride	0.11
Diethyl ether	0.03	4-methyl-2-pentanone	0.54
1,1,1-trichloroethane	0.11	Chloroacetonitrile	0.04
Benzene	20.17	1,3-dichlorobenzene	0.11
Carbon Tetrachloride	0.17	1,4-dichlorobenzene	0.76
Allyl Chloride	0.05	1,2-dichlorobenzene	0.15
1,2-dichloropropane	0.03	1,2,4-trichlorobenzene	0.47
Trichloroethylene	0.05	1,3-hexachlorobutadiene	0.13
cis-1,3-dichloropropene	0.02	2-Hexanone	0.71
MTBE	5.66	Methyl Methacrylate	1.64
Tetrahydrofuran	3.65	Ethyl Methacrylate	0.58
Methacrylonitrile	1.68		

Louisiana Department of Environmental Quality

Air Toxics Summary

Monitoring Site: Chalmette High School
Samples Collected: 148

Sample Duration: 24 hours
Sample Date Range: 4/29/2006-1/13/2009

All Concentrations are in parts per billion volume (ppbv)

<u>Compound</u>	<u>Mean</u>	<u>Max</u>	<u>Compound</u>	<u>Mean</u>	
<u>Max</u>					
Freon-12	0.52	0.66	trans-1,3-dichloropropene	0.00	0.03
Chloromethane	0.66	1.17	1,1,2-trichloroethane	0.00	0.04
Freon-114	0.02	0.05	Toluene	0.47	6.88
Vinyl Chloride	0.00	0.05	2-Butanone	0.42	1.54
1,3-butadiene	0.03	0.26	1,2-dibromoethane	0.00	0.04
Bromomethane	0.01	0.15	Tetrachloroethylene	0.01	0.08
Carbon disulfide	0.06	0.88	Methyl Acrylate	0.01	0.30
Chloroethane	0.00	0.05	Chlorobenzene	0.01	0.03
Freon-11	0.24	0.34	Ethylbenzene	0.08	2.06
Acetonitrile	0.25	0.55	m/p Xylene	0.28	9.02
1,1-dichloroethene	0.00	0.04	Styrene	0.02	0.11
Methylene Chloride	0.09	0.21	o Xylene	0.09	1.46
Freon-113	0.08	0.13	Nitrobenzene	0.01	0.48
Acetone	3.70	13.02	2-nitropropane	0.02	0.10
1,1-dichloroethane	0.00	0.05	1,1,2,2-tetrachloroethane	0.00	0.04
cis-1,2-dichloroethene	0.00	0.02	1,3,5-trimethylbenzene	0.02	0.16
Acrylonitrile	0.28	1.91	1,2,4-trimethylbenzene	0.08	0.61
Chloroform	0.03	0.30	Chlorobutane	0.00	0.03
1,2-dichloroethane	0.02	0.18	Benzyl Chloride	0.00	0.04
Diethyl ether	0.00	0.00	4-methyl-2-pentanone	0.01	0.33
1,1,1-trichloroethane	0.02	0.06	Chloroacetonitrile	0.00	0.04
Benzene	0.29	1.29	1,3-dichlorobenzene	0.00	0.04
Carbon Tetrachloride	0.09	0.13	1,4-dichlorobenzene	0.01	0.09
Allyl Chloride	0.00	0.00	1,2-dichlorobenzene	0.00	0.05
1,2-dichloropropane	0.00	0.04	1,2,4-trichlorobenzene	0.03	0.14
Trichloroethylene	0.01	0.07	1,3-hexachlorobutadiene	0.02	0.11
cis-1,3-dichloropropene	0.00	0.03	2-Hexanone	0.02	0.32
MTBE	0.00	0.06	Methyl Methacrylate	0.01	0.44
Tetrahydrofuran	0.01	0.52	Ethyl Methacrylate	0.00	0.23
Methacrylonitrile	0.02	0.51			

Louisiana Department of Environmental Quality

Air Toxics Summary

Monitoring Site: Algiers Entergy
 Samples Collected: 55

Sample Duration: Strike Samples
 Sample Date Range: 5/15/2006-8/20/2008

All Concentrations are in parts per billion volume (ppbv)

<u>Compound</u>	<u>Max</u>	<u>Compound</u>	<u>Max</u>
Freon-12	1.36	trans-1,3-dichloropropene	0.02
Chloromethane	1.04	1,1,2-trichloroethane	0.05
Freon-114	0.05	Toluene	25.51
Vinyl Chloride	0.06	2-Butanone	1.50
1,3-butadiene	0.43	1,2-dibromoethane	0.02
Bromomethane	0.06	Tetrachloroethylene	0.06
Carbon disulfide	1.20	Methyl Acrylate	0.18
Chloroethane	0.05	Chlorobenzene	0.05
Freon-11	0.36	Ethylbenzene	5.15
Acetonitrile	3.64	Vinyl Acetate	0.00
1,1-dichloroethene	0.03	m/p Xylene	18.81
Methylene Chloride	0.47	Styrene	0.15
Freon-113	0.11	o Xylene	7.44
Acetone	18.50	2-nitropropane	0.00
1,1-dichloroethane	0.03	1,1,2,2-tetrachloroethane	0.10
cis-1,2-dichloroethene	0.03	1,3,5-trimethylbenzene	2.56
Acrylonitrile	3.20	1,2,4-trimethylbenzene	8.90
Chloroform	0.09	Chlorobutane	0.03
1,2-dichloroethane	0.14	Benzyl Chloride	0.03
Diethyl ether	0.09	4-methyl-2-pentanone	0.06
1,1,1-trichloroethane	0.06	Chloroacetonitrile	0.00
Benzene	6.99	1,3-dichlorobenzene	0.11
Carbon Tetrachloride	0.11	1,4-dichlorobenzene	0.45
Allyl Chloride	0.18	1,2-dichlorobenzene	0.04
1,2-dichloropropane	0.03	1,2,4-trichlorobenzene	0.21
Trichloroethylene	0.07	1,3-hexachlorobutadiene	0.10
cis-1,3-dichloropropene	0.01	2-Hexanone	0.28
MTBE	0.03	Methyl Methacrylate	0.03
Tetrahydrofuran	0.33	Ethyl Methacrylate	0.01
Methacrylonitrile	0.43	Nitrobenzene	0.28

Louisiana Department of Environmental Quality

Air Toxics Summary

Monitoring Site : Algiers Entergy
 Samples Collected: 144

Sample Duration: 24 hours
 Sample Date Range: 4/5/2006-8/22/2008

All Concentrations are in parts per billion volume (ppbv)

<u>Compound</u>	<u>Mean</u>	<u>Max</u>	<u>Compound</u>	<u>Mean</u>	
<u>Max</u>					
Freon-12	0.51	0.65	trans-1,3-dichloropropene	0.00	0.02
Chloromethane	0.67	1.26	1,1,2-trichloroethane	0.00	0.06
Freon-114	0.02	0.06	Toluene	0.53	4.56
Vinyl Chloride	0.00	0.08	2-Butanone	0.43	1.92
1,3-butadiene	0.05	0.47	1,2-dibromoethane	0.01	0.07
Bromomethane	0.02	0.54	Tetrachloroethylene	0.02	0.16
Carbon disulfide	0.07	0.78	Methyl Acrylate	0.00	0.24
Chloroethane	0.00	0.07	Chlorobenzene	0.01	0.07
Freon-11	0.24	0.31	Ethylbenzene	0.09	0.40
Acetonitrile	*0.17	*0.76	m/p Xylene	0.31	1.53
1,1-dichloroethene	0.00	0.08	Styrene	0.03	0.23
Methylene Chloride	0.09	0.37	o Xylene	0.12	0.50
Freon-113	0.08	0.15	Nitrobenzene	0.01	0.20
Acetone	4.59	12.98	2-nitropropane	0.00	0.12
1,1-dichloroethane	0.01	0.07	1,1,2,2-tetrachloroethane	0.00	0.04
cis-1,2-dichloroethene	0.00	0.03	1,3,5-trimethylbenzene	0.04	0.15
Acrylonitrile	*0.07	*1.04	1,2,4-trimethylbenzene	0.10	0.49
Chloroform	0.03	0.11	Chlorobutane	0.00	0.04
1,2-dichloroethane	0.03	0.28	Benzyl Chloride	0.00	0.02
Diethyl ether	0.00	0.06	4-methyl-2-pentanone	0.01	0.11
1,1,1-trichloroethane	0.02	0.10	Chloroacetonitrile	0.00	0.00
Benzene	0.36	1.29	1,3-dichlorobenzene	0.00	0.03
Carbon Tetrachloride	0.09	0.14	1,4-dichlorobenzene	0.04	0.24
Allyl Chloride	0.00	0.09	1,2-dichlorobenzene	0.00	0.03
1,2-dichloropropane	0.00	0.03	1,2,4-trichlorobenzene	0.04	0.12
Trichloroethylene	0.02	0.12	1,3-hexachlorobutadiene	0.03	0.12
cis-1,3-dichloropropene	0.00	0.03	2-Hexanone	0.02	0.53
MTBE	0.00	0.02	Methyl Methacrylate	0.00	0.15
Tetrahydrofuran	0.01	0.32	Ethyl Methacrylate	0.00	0.01
Methacrylonitrile	*0.01	*0.60			

* Concentrations estimated due to sampler contamination.